Noise Measurement Results at MBTA Ashmont Station

Public Meeting

All Saint's Church

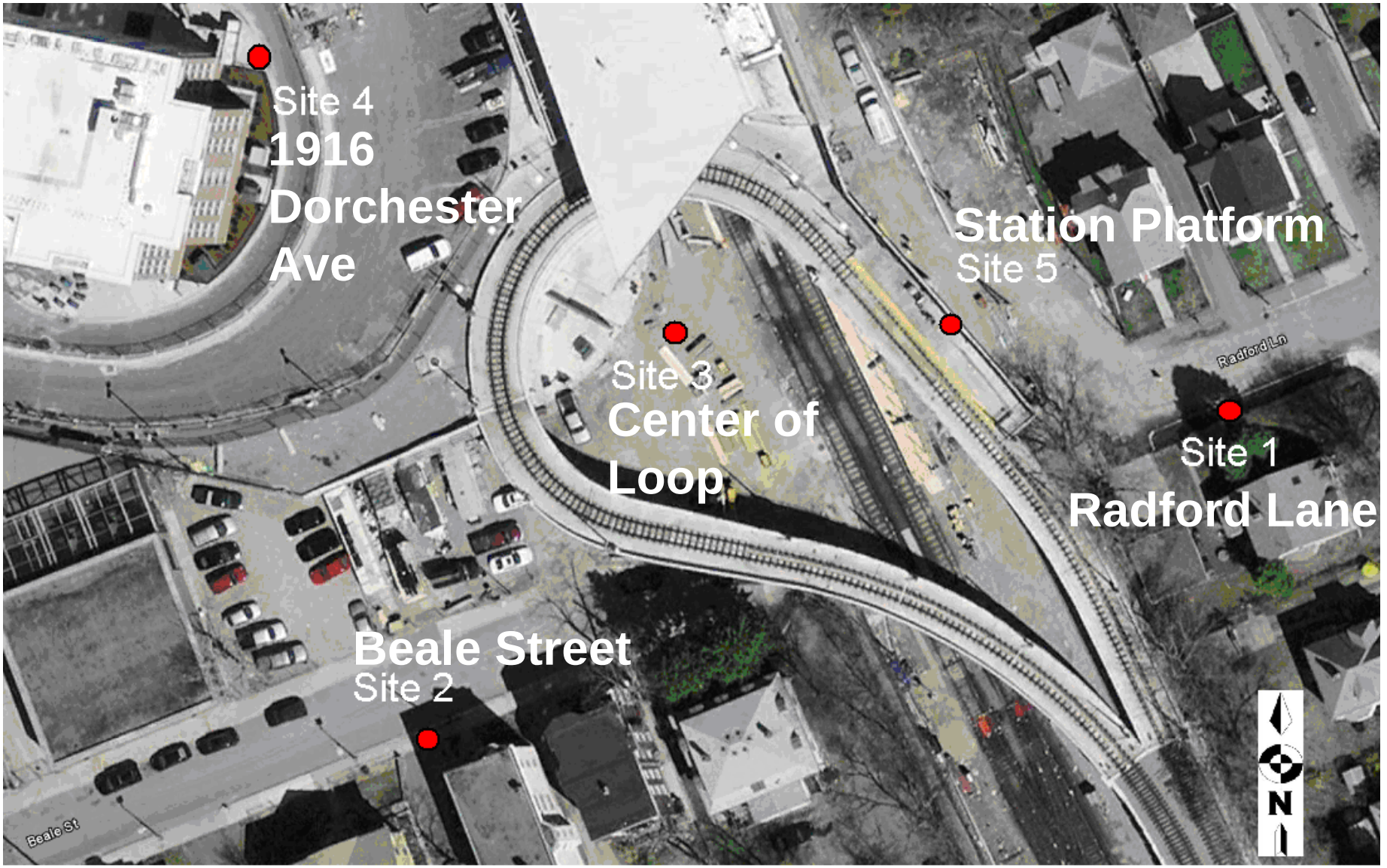
Dorchester, MA

July 20, 2010

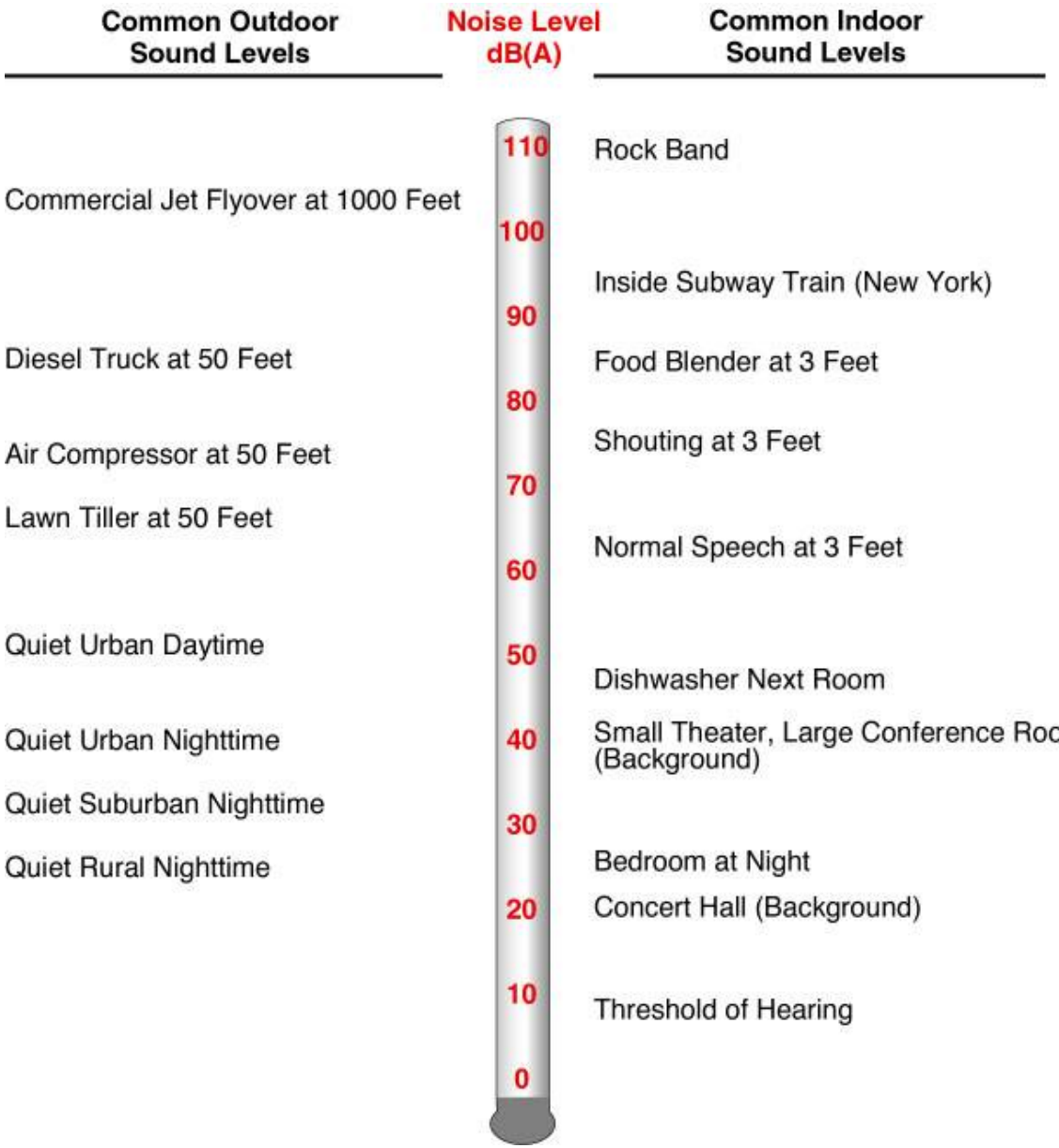
Jason Ross, P.E.

Harris Miller Miller & Hanson Inc.

Measurement Locations



Noise Level Basics



- **A-weighted noise levels measured in decibels (dBA) are the basic measure of noise**
- **Normal speech is 60 to 65 dBA at 3 feet**
- **A food blender is 85 dBA at 3 feet**

Noise Measurements

- **Noise from the MBTA Ashmont PCC train cars was measured for the entire approach to the station and departure from the station**

- **Noise was measured with a Bruel & Kjaer 2250 Sound Level Meter (Type I)**

- **Equipment was calibrated in field and by a laboratory traceable to the National Institute of Standards and Technology**

Noise Equipment Calibration Certificates

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
and relevant requirements of ISO 9002: 1994
ACCREDITED by NVLAP
(an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.20472

Instrument:	**Sound Level Meter**	*Date Calibrated:*	**9/11/2009**
Model:	**2250**	*Status:*	**Received / Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	**X / X**
Serial number:	**2619791**	*Out of tolerance:*	
Tested with:	**Microphone 4189 s/n 2616507** **Preamplifier ZC0032 s/n 7764**	*See comments:*	
Type (class):	**1**	*Contains non-accredited tests:*	**__Yes _X_ No**
		Calibration service:	**__ Basic _X_ Standard**
Customer:	**Harris Miller Miller & Hanson Inc.**	*Address:*	**77 South Bedford Street**
Tel/Fax:	**781-229-0707/ -7939**		**Burlington, MA 01803**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., 06/07/2005
SLM & Dosimeters – Acoustical Tests, Scantek Inc., 06/15/2005

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jan 2, 2009	Scantek, Inc./NVLAP	Jan 2, 2010
DS-360-SRS	Function Generator	61646	Nov 19, 2007	Davis Inotek / A2LA	Nov 19, 2009
34401A-Agilent Technologies	Digital Multimeter	MY41022043	Nov 13, 2008	Transcat / NVLAP	Nov 13, 2009
DPI 141-Druck	Pressure Indicator	790/00-04	Nov 21, 2008	Transcat / NVLAP	Nov 21, 2010
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	May 7, 2008	Vaisala / A2LA	Nov 7, 2009
PC Program 1019 Norsonic	Calibration software	v.46	Validated Dec 2006	-	-
1253-Norsonic	Calibrator	25726	Jan 2, 2009	Scantek, Inc./NVLAP	Jan 2, 2010

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.8 °C	100.244 kPa	57.7 %RH

Calibrated by	Valentin Buzduga	Checked by	Mariana Buzduga
Signature		Signature	
Date	9/11/2009	Date	9/14/2009

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Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540: 1994 Part 1
and relevant requirements of ISO 9002: 1994
ACCREDITED by NVLAP
(an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.20480

Instrument:	**Acoustical Calibrator**	*Date Calibrated:*	**9/11/2009**
Model:	**4231**	*Status:*	**Received / Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	**X / X**
Serial number:	**2579292**	*Out of tolerance:*	
Class (IEC 60942):	**1**	*See comments:*	
Barometer type:		*Contains non-accredited tests:*	**__Yes _X_ No**
Barometer s/n:			
Customer:	**Harris Miller Miller & Hanson Inc.**	*Address:*	**77 South Bedford Street**
Tel/Fax:	**781-229-0707/ -7939**		**Burlington, MA 01803**

Tested in accordance with the following procedures and standards:
Calibration of Acoustical Calibrators, Scantek Inc., 06/06/2005

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jan 2, 2009	Scantek, Inc./NVLAP	Jan 2, 2010
DS-360-SRS	Function	61646	Nov 19, 2007	Davis Inotek / A2LA	Nov 19, 2009
34401A-Agilent Technologies	Digital Multimeter	MY41022043	Nov 13, 2008	Transcat / NVLAP	Nov 13, 2009
DPI 141-Druck	Pressure Indicator	790/00-04	Nov 21, 2008	Transcat / NVLAP	Nov 21, 2010
8903A-HP	Audio Analyzer	2514A05691	Jan 2, 2008	Transcat/ NVLAP	Jan 2, 2010
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	May 7, 2008	Vaisala / A2LA	Nov 7, 2009
PC Program 1018 Norsonic	Calibration software	v.44	Validated May 2006	-	
1253-Norsonic	Calibrator	28326	Feb 16, 2009	Scantek, Inc. / NVLAP	Feb 16, 2010
1203-Norsonic	Preamplifier	14051	Jan 2, 2009	Scantek, Inc./ NVLAP	Jan 2, 2010
4180-Bruel&Kjaer	Microphone	2246115	Mar 7, 2008	NPL (UK) / UKAS	Mar 7, 2010

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by	Valentin Buzduga	Checked by	Mariana Buzduga
Signature		Signature	
Date	9/11/2009	Date	9/14/2009

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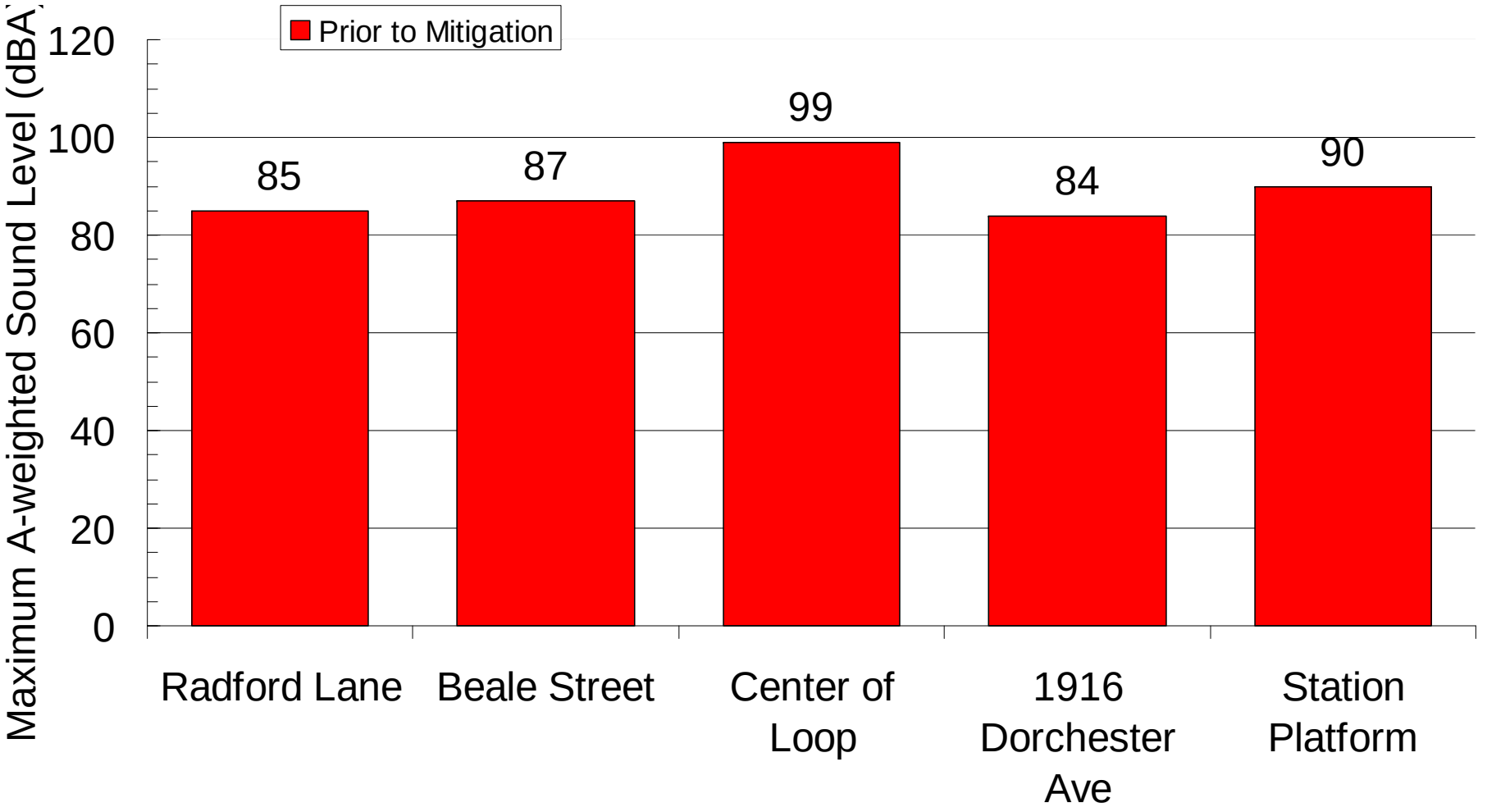
Noise Metric

- **Maximum Noise level -- Lmax**
  - The highest noise level which occurs during approach to or departure from the station

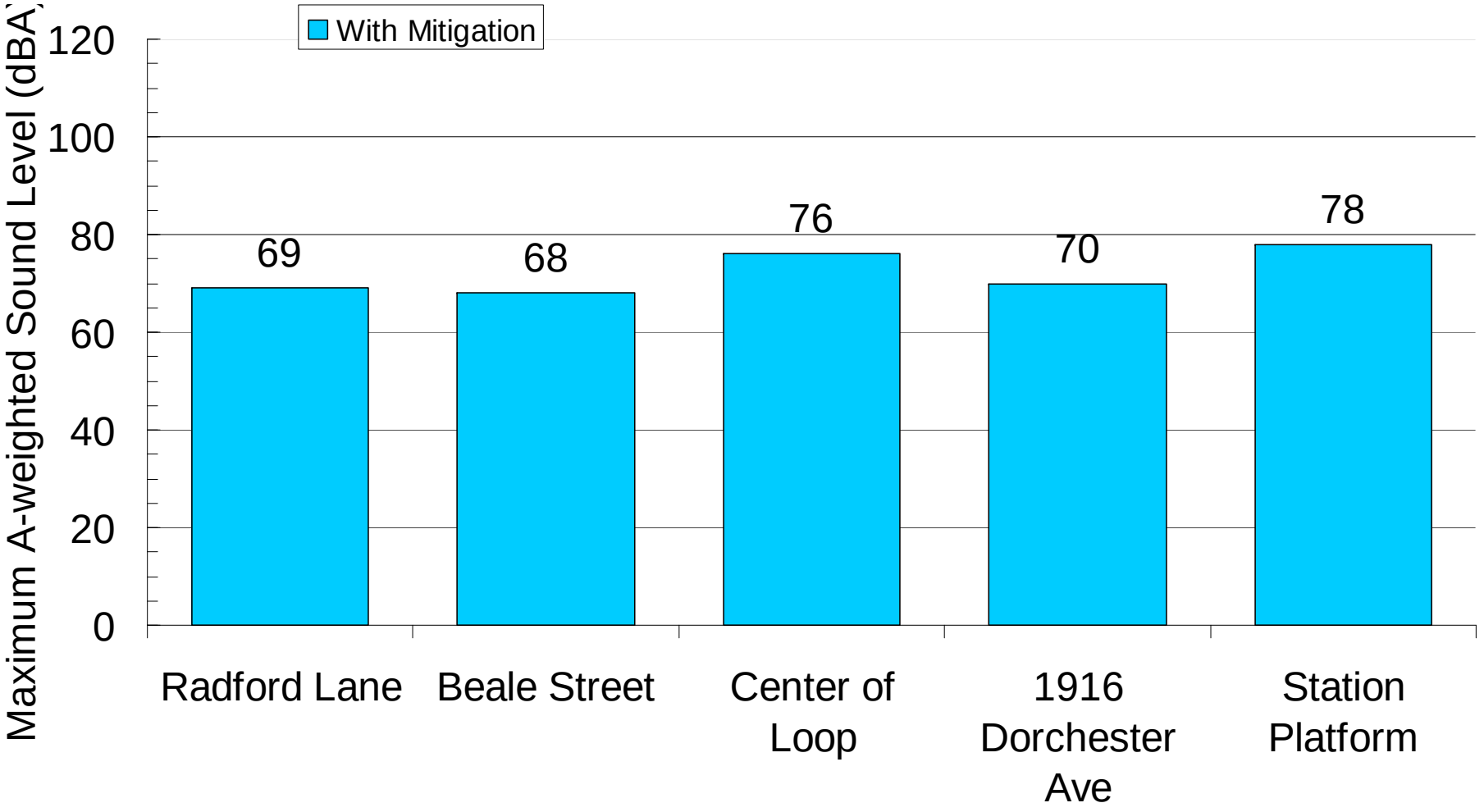
Noise Measurement Results

Prior to mitigation maximum noise levels were 84 to 99 dBA



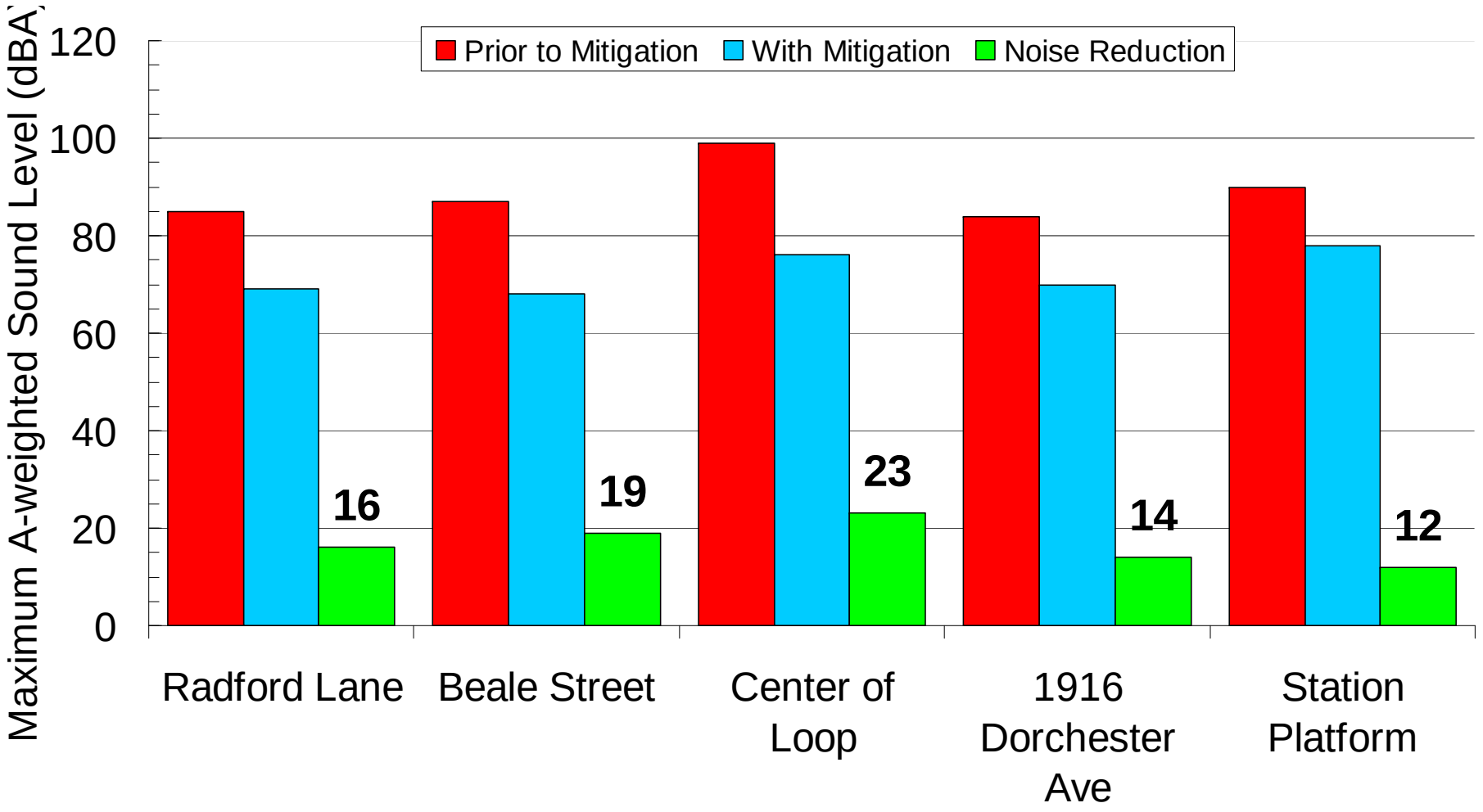
Noise Measurement Results

With mitigation maximum noise levels were 68 to 78 dBA



Noise Measurement Results

Mitigation reduced maximum noise levels 12 to 23 dBA



Noise Measurement Results

- **Mitigation reduced maximum noise levels 12 to 23 decibels**
- **On average noise was reduced 17 decibels**
  - Prior to mitigation, wheel squeal was often audible for the entire departure from the station (30 to 45 seconds)
  - With mitigation, wheel squeal was typically audible for only a few seconds during the departure from the station
- **Noise levels reductions:**
  - Sounds that are 10 decibels lower are considered 1/2 as loud
  - Sounds that are 20 decibels lower are considered 1/4 as loud
- **Frequency analysis has identified the problematic tones to assist in long-term corrective actions**

Noise Measurement Results